Out of mind, out of heart: Attention affects duration of emotional experience

Freund, Alexandra M ; Keil, Andreas

Abstract: It has been suggested that the extent to which a person maintains attention to pleasant versus unpleasant aspects of a given stimulus has an effect on the self-reported affective state. This assumption was empirically tested in two experiments. In Study 1, participants received the instruction either to focus on a positive emotion-eliciting event (winning a tournament chess game) or to focus their attention on an affectively neutral distraction task (describing drawings). Study 2 used negative performance feedback in a cognitive task to induce unpleasant affect and included three experimental groups (waiting condition, continuing with the same cognitive task, distraction by a different cognitive task). Results converged to show that distracting attention away from the emotion-eliciting event leads to a shorter duration of the emotional experience. These findings support the attention-focus hypothesis.

DOI: https://doi.org/10.1080/02699931.2012.725574

Running Head: OUT OF MIND, OUT OF HEART

Out of mind, out of heart: Attention affects duration of emotional experience

Alexandra M. Freund[1] & Andreas Keil[2]

[1]University of Zurich, Department of Psychology, [2] University of Florida, Gainesville, FL

BRIEF REPORT

number of words: 3996
number of figures: 1
number of references: 23

Author Note

Address correspondence to: Alexandra M. Freund, University of Zurich, Department of Psychology. Andreas Keil, Department of Psychology and National Institute of Mental Health (NIMH) Center for the Study of Emotion & Attention, University of Florida.

Address correspondence to Alexandra M. Freund, University of Zurich, Department of Psychology, Binzmuehlestrasse 14 / 11, 8050 Zurich, Switzerland; freund@psychologie.uzh.ch

Acknowledgements

We would like to thank Steffen Wanza, Hannah Steinbach, Annina Singer, Pascale Elsner, Peter Hilpert, Sandra Oeschger, Eva Sigrist, Stefanie Traber, for their help in collecting the data and piloting various versions of distracting material that does not itself induce positive or negative mood.

Abstract

It has been suggested that the extent to which a person maintains attention to pleasant versus unpleasant aspects of a given stimulus has an effect on the self-reported affective state. This assumption was empirically tested in two experiments. In Study 1, participants received the instruction either to focus on a positive emotion-eliciting event (winning a tournament chess game) or to focus their attention on an affectively neutral distraction task (describing drawings). Study 2 used negative performance feedback in a cognitive task to induce unpleasant affect, and included three experimental groups (waiting condition, continuing with the same cognitive task, distraction with a different cognitive task). Results converged to show that distracting attention away from the emotion-eliciting event leads to a shorter duration of the emotional experience. These findings support the attention-focus hypothesis.

(131 words)

Key words: Emotion duration, attention, focus, distraction

Out of mind, out of heart: Attention affects duration of emotional experience

To the surprise of psychologists and lay people alike, even dramatic life-events such as winning a lottery or not getting tenured as a professor do not seem to affect our self-reported emotional state for very long (Frederick & Loewenstein, 1999; Gilbert, Pinel, Wilson, Blumberg, & Wheatly, 1998). This phenomenon of returning quickly to one's prior level of emotions after experiencing positive or negative events has been labeled the hedonic treadmill (for an overview see Frederick & Loewenstein, 1999). There are various explanations for this effect. The classic account is based on Adaptation Level Theory (Helson, 1964), which posits that the experience of an event shifts the adaptation level by establishing a new setpoint, thus changing the level of stimulation that is perceived as neutral. Similarly, habituation may lead to desensitization, i.e., a diminished subjective intensity in the experience of a stimulus.

Different to Helson's model of a neutral setpoint, Diener, Lucas, and Scollon (2004) suggest that typically the setpoint is not neutral, leading to the fact that most people experience positive emotions most of the time. This notion is consistent with self-reported affective reactions to standardized stimuli, which reliably show a tendency towards appetitive responding to calm stimuli (Cacioppo & Gardner, 1999). It also extends to physiological measures of emotional reactivity that suggest stronger appetitive engagement in most situations characterized by low or moderate arousal (cf., positivity off-set, Caccioppo, Gardner, & Berntson, 1997). Not surprisingly, then, most people feel happy most of the time (Diener & Diener, 1996).

Returning to the phenomenon of the hedonic treadmill, the question remains why the effects of even big events such dissipate rather quickly. Gilbert and colleagues (1998) have proposed that a "psychological immune system" helps through various cognitive strategies such

as downward social comparisons to cope with negative events much more efficiently than we might expect. Their research has focused on the gap between the expected and actual duration of events and suggests that people do not take their "psychological immune system" into account when predicting the affective impact and duration of events. One of the reasons for the inaccurate prediction of the affective duration is focalism. Focalism refers to the phenomenon that people tend to focus on the emotion eliciting event when predicting their future feelings instead of taking other hassles and uplifts of everyday life into account that will also influence their emotional state (Gilbert et al., 1998). Implicit in the notion of focalism is that the actual emotional experience at any given point in time is determined not only by the severity of one event but an integration of the various events a person encounters.

Various theoretical accounts in the tradition of the adaptation level model suggest complex models of this integration. Most of these models assume a weighted average of past events, and some also assume that the weight increases with recency (e.g., Hardie, Johnson, & Fader, 1993). The current paper posits a more parsimonious account to such integration models, namely the attention-focus hypothesis. In short, the attention-focus hypothesis claims that the duration of the emotional experience in response to events is crucially determined by the attention they receive. In other words, events are expected to influence people's self-reported affective state as long as they attend to them.

The role of attention for emotion

Most theories converge to suggest that emotional experience is a function of past events and a complex set of cognitive and physiological processes that can be viewed as being part of the emotional response to the situation, as posited by network models of emotion (e.g., Lang,

1993). The question arises whether the cognitive processes associated with temporal change in affective experience can be experimentally characterized. In this report, we examine changes of self-reported affect when manipulating the attentional focus to be on versus away from an engaging event.

Although the role of selective attention for modulating responses to emotional stimuli has been at the core of psychophysiological and experimental studies, the hypothesis that time dynamics of emotional experience are affected by attention focus has not yet been systematically tested. One of the areas having adopted an attention-focus hypothesis is research on emotion regulation. In fact, there appears to be widespread agreement among researchers of emotion regulation that whatever is in the focus of attention influences emotional experience. Eisenberg, Fabes, Nyman, Bernzweig, and Pinuelas (1994, p. 110) summarize as one of the core assumptions of theories of emotion regulation that "regulation frequently involves attentional processes (such as attention shifting and attention focusing…)" According to Gross (2002), the deliberate deployment of attention is highly relevant for generating, maintaining, or altering an emotional response. For instance, when watching a movie about painful surgery, focusing attention on the surgeon's glasses rather than the blood gushing from the patient's wound should decrease people's experience of negative emotions. In a study by Gross, Richards, and John (2008), participants reported using attentional deployment (looking away) in about 40% of remembered everyday episodes in which they attempted to alter their emotional experience. Work in clinical psychology has used a more direct approach in investigating the effect of *distraction* – i.e., focusing one's attention away from an emotion-eliciting event – versus *rumination* on subsequent emotional experience. It is often argued that such a distraction process

is intrinsically similar to mechanisms induced during cognitive behavioral interventions. For instance, Fennell, Teasdale, Jones, and Damlé (1987) found that distraction (i.e., concentrating on a series of slides depicting outdoor scenes) reduced the frequency of self-reported depressed mood in patients low in endogenous depression. Conversely, in a sample of patients with major depression, Nolen-Hoeksema and Morrow (1993) found that depression symptoms *increased* when ruminating (i.e., focusing attention on the causes and consequences of a given problem) whereas depression ratings *decreased* during distraction. In a non-clinical group, Joormann and Siemer (2004) induced either positive or negative affect with film clips and then manipulated the focus of cognitive elaboration (internal/rumination versus external/distraction). As expected, sadness when watching a sad film decreased more slowly when participants were instructed to focus their attention on their own emotions, symptoms, or self, than when distracting attention away from the sad content. Brain electrophysiology also has suggested that shifts of attention from arousing to non-arousing aspects of the same visual scene reduces markers of emotional engagement (Hajcak, Dunning, & Foti, 2009). This does not imply, however, that emotions can only be elicited when the stimuli are in the focus of attention: Intense emotional stimuli elicit measurable physiological and self-report changes even when outside the focus of spatial attention (Keil, Moratti, Sabatinelli, Bradley, & Lang, 2005), or when competing with a distracting task (Müller, Andersen, & Keil, 2008).

How can these two sets of findings be reconciled? On the one hand, keeping attention on negative thoughts as is found during rumination seems to prolong negative emotional states. On the other hand, emotional stimuli can elicit emotions even when they are outside the focus of attention. A potential mechanism mediating the results reviewed above is the *duration* of specific

aspects of the emotional response. One hypothesis that is consistent with both (a) rapid emotional engagement in response to intense stimuli and (b) reduction of such a response by distraction is that the *duration* of emotional experience after an engaging event depends on the attentional focus. Although attention might not be crucial for eliciting an emotional response, the emotional experience lasts longer when keeping attention on the event than when distracting attention away from the affective stimulus. Studies in the field of emotion regulation suggest that rumination leads to increased and prolonged experiences of negative emotions. Rumination, however, includes thinking about the role of the self for the negative events and, according to Nolen-Hoeksema's research, appears to exacerbate negative thinking. The current report examines effects of attention focus on the duration of emotional reactions to positive events occurring in a natural situation (i.e., winning in a chess tournament, Study 1). Study 2 examines the effects of distraction on displeasure evoked by providing negative performance feedback on a cognitive task. Study 1 uses two experimental conditions (focusing attention vs. distraction), Study 2 comprises three conditions (waiting condition, continuing with the "failure" task, switching to a different task). As an initial and preliminary test of the attention-focus hypothesis, a pilot study was conducted. Based on the literature reviewed above, we predicted that distraction would shorten the duration of both pleasurable and aversive experience.

Pilot Study and Study 1: Attentional Focus and Duration of Positive Affect

Pilot Study

Methods

Sample. The sample consisted of $N = 15$ students at the University of Zurich (20 - 45 yrs, $M = 26$; 13 females).

Procedure and measures. After giving informed consent, participants filled out a brief demographic questionnaire and a measure of their current affective state. Pleasure/displeasure was assessed using a visual analogue scale (VAS) with a frowning face (indicating maximum displeasure) on one end and a smiling face (indicating maximum pleasure) on the other of a 20 cm horizontal line. Pleasure and displeasure was then scored relative to the midpoint, resulting in a scale ranging between -10 (extreme displeasure) and 10 cm (extreme pleasure). The question read "*How unhappy / happy are you right this moment?"* Then, participants solved the embedded pictures test (Witkin et al., 1971), which was introduced as a test of visual spatial abilities. All participants received highly positive feedback on their performance independent of their actual performance. Immediately after that, participants indicated their current affective state (manipulation check). Then, participants were assigned randomly either to the *attention focus* or the *distraction* condition. In the attention focus condition, participants were asked to write down what the positive feedback meant to them and how they felt about it. In the distraction condition, participants were asked to describe how to get from one place to another on a map that was set before them. In both conditions, participants were asked five times after an interval of 90 seconds each to indicate their current affective state. Participants were thanked and debriefed. They received course credit for participation.

Results

The two experimental groups did not differ in their baseline affect ($T(13) = 1.91$, n.s.). The manipulation of positive affect was successful as indicated by a significant increase in positive affect after receiving the positive feedback of task performance ($F(1,13) = 4.63$, $p = .05$). This effect did not differ between experimental groups (interaction experimental group x

pre-post affect: $F(1, 13) = 0.007$, n.s.). A repeated measures ANOVA revealed a statistical trend for an interaction between experimental group and affect over time ($F(5, 60) = 2.04$; $p < .09$). As expected, distracting attention from the positive event (feedback on good performance) led to faster decline of positive affect than focusing attention on the event (see Figure 1, panel A).

Study 1: Chess Study

The pilot study provides preliminary support of the hypothesis that attentional focus impacts the duration of the emotional experience. Study 1 aimed at replicating this effect in a naturalistic environment using a personally meaningful event. Moreover, Study 1 used a different distraction task so as to rule out that the effects of the pilot study are due to the specific distraction task.

Method

Participants. 60 participants of a chess tournament held in Zurich, Switzerland, volunteered after their match to take part in the study. The majority of the chess players were male (56 men; 18 - 73 yrs, $M = 46.17$). Eight players had to be excluded because the match had ended undecided and a second round was scheduled. Twelve participants had lost the match, which resulted in a very small group size of six participants in each condition, too small for further analyses. Thus, this experiment focused on the winning experience. $N = 40$ participants who reported having won the previous match were included in the final analyses (21 in the focus condition, 96.7% male; 19 in the distraction condition, 90% male).

Procedure and measures. Outside of the tournament room, two research assistants waited for the contestants and asked them if they were willing to participate in a short study. The procedure was the same as in the pilot study with the exception of the emotion induction. Here,

the positive event was winning the previous game of chess. After giving informed consent, participants filled out a brief demographic questionnaire and a measure of their current affective state using the same scale as in the pilot study. Participants were then randomly assigned to the *attention-focus* or the *distraction* condition. In the attention-focus condition, participants were asked to write down what winning the previous chess match means to them, and how they felt about it. In the distraction condition, participants were asked to describe drawings of arrangements of simple geometrical figures (triangles, squares, lines). Pilot testing had indicated that describing these drawings does not affect affective state. In both conditions, participants were asked seven more times after an interval of 60 seconds each to indicate their current pleasure/displeasure on the visual analogue scale. Participants were thanked and debriefed. As compensation for their participation, they received sweets (chocolate bars, gummi bears) and entered a raffle for 20 book vouchers worth 15 Swiss Franks ($15 at the time).

Results

The experimental groups did not differ in their baseline affect ($T(38) = -0.30$, n.s.). A repeated measures ANOVA revealed a significant interaction of experimental group and affect over time ($F(7, 266) = 4.48$; $p < .001$; $pEta^2 = .10$). As expected, distracting attention from the positive event (i.e., the success in the previous chess game) led to faster decline of positive affect than focusing attention on the event.

Study 1 shows that the preliminary results of the pilot study can be replicated using a positive real-life event such as the winning a match in a chess tournament. People who focus their attention on the success report feeling better for longer periods of time than people who distract their attention away from it. Study 1 did not allow testing if the results also hold for

negative feelings. This was the main question of Study 2. As a further experimental control, Study 2 also included a waiting group along with the attention-focus and distraction groups

Study 2: Negative Feedback in a Cognitive Task

Method

Participants. A total of 54 undergraduate students participated in the study, and were given class credits or a small financial bonus for their participation. Their mean age was 24.2 years; 29 were female. Participants gave written informed consent prior to and debriefed after the experimental session. Distribution of gender in the three experimental groups was equal.

Procedure and measures. All participants began the session (time 1) by indicating their present level of pleasure/displeasure on a visual analogue scale (VAS), as described for Study 1. Then all participants worked on a version of the continuous performance task (CPT), which required identification (key press) of repetitions of all elements in a 3-by-3 visual array that contained random combinations of all special signs available on a QWERTY keyboard. Participants were asked to respond as fast and accurate as possible, whenever they detected a change. Stimulus arrays were displayed for 800 ms followed by 400 ms of black screen and then by the next array. Feedback was given after blocks of 20 trials (i.e., after 24 seconds), and was designed to be negative in all three groups: Participants were shown a bar graph showing false feedback on their own performance in relation to the overall group's performance, accompanied by one of the following text labels, shown at the bottom of the bar graph: "satisfactory," "acceptable," "inadequate," "unacceptable." Feedback bars varied to randomly indicate values between 2% and 28% performance. It was explained to participants that this reflected a compound score of their accuracy and speed, indicative of their ability concentrate and function

well cognitively. 40 blocks of trials were run in total. Immediately after completion of the CPT (time 2), all participants indicated their affective state on the VAS again. They were then randomly assigned to three different groups: (1) waiting condition (participants stayed in a waiting area for 20 minutes with no books/journal/magazines, TV or other media available); (2) attention focus condition (participants continued to work for 20 minutes on the same CPT task and presented with false feedback of cumulative scores ranging between 2% and 28%, supposedly reflecting their previous and present performance; (3) distraction group (participants worked for 20 minutes on another computer task involving sorting and matching incoming 3-dimensional elements to gaps in a reference surface, alike the popular 1990s game Tetris; no feedback was provided). After completion of this block, all participants indicated their affective state on the self-report measures for a third time (time 3).

Results

A 3 (group) x 3 (time) ANOVA indicated that the time course of affective self-report across the three measurement points differed for the three groups ($F(4, 102) = 4.53$; $p < .01$). When examined for the time points separately, the experimental groups did not differ in their baseline affect ($F(2, 51) = 1.1$; n.s.), nor was there a group difference after the CPT feedback phase ($F(2, 51) = 0.1$; n.s.). However, after the manipulation groups differed ($F(2, 51) = 9.8$; $p < .01$; $pEta^2 = .24$), indicating that distracting attention from the negative event (here: engaging in a different computer task) led to a greater increase in reported pleasure than focusing attention on the event ($T(34) = 3.9$; $p < .01$), or waiting ($T(34) = 3.1$; $p < .01$). Importantly, waiting and maintaining the attention focus did not differ ($T(34) = 1.4$; n.s., see Figure 1, panel c).

Discussion

Three experiments provide first empirical support for the hypothesis that the duration of an emotional experience depends on the attentional focus. The present set of studies represents an empirical test of the long-standing assumption in research on emotion regulation (e.g., Eisenberg et al., 1994) that, as of yet, has not been tested directly. The results of the present studies suggest that positive and negative emotional experiences tend to be shorter when attention is distracted away from it. The studies provide converging evidence using different emotion-eliciting events (Pilot study: positive performance feed-back; Study 1: winning a real-life chess game in a tournament; Study 2: negative performance feed-back) and different tasks used for distraction (Pilot study: describing directions on a map; Study 1: describing geometrical drawings; Study 2: engaging in a different task). Whereas each of the individual studies does not provide sufficient evidence to make a strong case for the attention-focus hypotheses, their results converge across independent samples and different tasks.

One of the limitations of the chess studies is that we did not assess the time since the match. It might be that some of the participants had already engaged in some kind of emotion regulation that might have brought them back to their affective setpoint. Contestants were asked immediately after they left the tournament room if they were willing to participate in the study. As we wanted to minimize the time between the match and the study, we limited our questions to the bare minimum. Unfortunately, we did not assessed the time since the match was finished. Nevertheless, results suggest that focusing attention on the match lead to better mood that was maintained longer compared to the distraction task. This result is in line with the attention-focus hypothesis.

An interesting question is if distraction leads to a change in affect or if focusing attention leads to a maintenance of affect. Inspection of Figure 1 suggests that both is the case. In Study 1 (chess study), focusing on the positive event increased mood while distraction kept it on a significantly lower level. Study 2 (negative performance feedback) showed that distraction increased positive mood while focusing attention on the failure task kept the mood on the same low level as directly after receiving the negative feedback. Attending to an emotion-eliciting stimulus, then, seems to intensify the emotion to some degree (chess study) or keep it at the same level (pilot study, negative feedback study). Future studies are needed to investigate under which conditions an attention focus intensifies and under which it maintains the level of emotional experience.

Thus, whereas each of the individual studies does not provide sufficient evidence to make a strong case for the attention-focus hypotheses, their results converge across independent samples and different tasks. Thus, despite limitations of each of the studies, taken together the results provide empirical support of the attention-focus hypothesis. The present findings thus complement physiological and brain research on the time course of emotional engagement, supplying information on the dynamics of self-reported affect when facing different laboratory and real-life situations.

Results suggest that focusing attention on an emotion-eliciting event and the subsequent experiences increases the duration of self-reported affect, compared to conditions in which attention is diverted away from them. On a theoretical level, this implies that there might be a more parsimonious alternative explanation to the more complex adaptation models explaining the hedonic treadmill (see Frederick & Loewenstein, 1999). Providing empirical support for an

assumption that is often made in research on emotion regulation, it seems that emotional experience is affected by shifts of the focus of attention. Such a view is consistent with network models of emotion (e.g., Lang, 1993), which suggest that the emotional response to an event is a result of the complex interplay between perceptual representations, physiological reactivity, behavioral dynamics, and cognitive processes, including attention. The present attention-focus hypothesis suggests that it is not the strength or intensity of an event alone that determines the duration of the related emotions but that the duration of the affective response varies as a function of whether and how long it stays in the focus of attention. This is consistent with the finding that some events such as marriage can exert long-lasting emotional effects (see Diener & Diener, 1996). Events that are related to many others in one's everyday life (e.g., marriage) exert longer lasting emotional influences than equally intense events that are more isolated and hence are less likely to stay in or reenter one's focus of attention.

Many authors have discussed the lack of convergence between levels of emotional reactivity (Lang, 1993), and have emphasized that the level of subjective experience might not necessarily be correlated with other indices of emotional engagement, for instance physiological or behavioral measures (Frijda, 1988). In line with these notions, analysis of hedonic responding to events and stimuli over time has often suggested that informative differences between individuals and/or experimental conditions are reflected in time dynamics rather than in static measures of liking/disliking (Rozin, Ebert, & Schull, 1982).

In sum, the present results are consistent with the notion that strong emotional events initially attract attention, possibly to allow prioritized responses to relevant situations. In addition, subsequent distraction may alter the duration of the initial emotional response, at least

on the level of subjective experience and affective report. In the present studies, this resulted in a more rapid decrease of reported affect in the distraction conditions. The rather slow time course of these changes supports the idea that competition for processing resources is a sustained interactive process in a highly complex system. Importantly, the present results, reflecting reactivity in a near-real-world setting, are consistent with laboratory research on emotion-cognition interactions. In the laboratory, evidence for initial automatic emotion processing has been observed mainly with stimuli bearing high relevance for the observer such as affective scenes high in emotional arousal (Bradley, et al., 2003). By contrast, other experiments have suggested that the processing of emotional faces requires selective attention and suffers from demanding concurrent tasks (Pessoa, 2005). In terms of affective report in situations with high relevance to the participant, both processes seem to contribute to a temporal pattern as observed in our studies. This pattern is characterized by attending to the engaging event, but leaving behavioral flexibility to address concurrent requirements an individual faces, which then are at the cost of the subjective component of emotional engagement. Future research may address the question whether such time dynamics are related to depression and anxiety as well as the interplay of cognition and emotion.

References

Bradley, M. M., Sabatinelli, D., Lang, P. J., Fitzsimmons, J. R., King, W., & Desai, P. (2003). Activation of the visual cortex in motivated attention. *Behavioral Neuroscience, 117*, 369-380.

Cacioppo, J. T., & Gardner, W. L. (1999). Emotion. *Annual Review of Psychology, 50*, 191-214.

Cacioppo, J. T., Gardner, W. L., & Berntson, G. G. (1997). Beyond bipolar conceptualizations and measures: The case of attitudes and evaluative space. *Personality and Social Psychology Review, 1*, 3-25.

Diener, E., & Diener, C. (1996). Most people are happy. *Psychological Science, 7*, 181-185.

Diener, E., Lucas, R.E., & Scollon, C. N. (2006). Beyond the hedonic treadmill. Revising the adaption theory of well-being. *American Psychologist, 61,* 305-314.

Eisenberg, N., Fabes, R. A., Nyman, M., Bernzweig, J., & Pineulas, A. (1994). The relations of emotionality and regulation to children's anger-related reations. *Child Development, 65,* 109-128

Fennell, M. J., Teasdale, J. D., Jones, S., & Damlé, A. (1987). Distraction in neurotic and endogenous depression: An investigation of negative thinking in major depressive disorder. *Psychological Medicine, 17,* 441-452

Frederick, S., & Loewenstein, G. (1999). Hedonic adaptation. In D. Kahnemann, E. Diener, & N. Schwarz (Eds.), *Well-being: The foundation of hedonic psychology* (pp. 302-329). New York: Russell Sage Foundation.

Frijda, N. H. (1988). The laws of emotion. *American Psychologist, 43*, 349-358.

Gilbert, D. T., Pinel, E. C., Wilson, T. D., Blumberg, S. J., & Wheatly, T. P. (1998). Immune neglect: A source of durability bias in affective forecasting. *Journal of Personality and Social Psychology, 75*, 617-638.

Gross, J. J. (2002). Emotion regulation: Affective, cognitive, and social consequences. *Psychophysiology, 39*, 281-291.

Gross, J.J., Richards, J.M., & John, O.P. (2006). Emotion regulation in everyday life. In D.K. Snyder, J.A. Simpson, & J.N. Hughes (Eds.) *Emotion regulation in families: Pathways to dysfunction and health*. Washington (pp. 13-35). Washington, DC: American Psychological Association.

Hajcak, G., Dunning, J. P., & Foti, D. (2009). Motivated and controlled attention to emotion: time-course of the late positive potential. *Clinical Neurophysiology, 120*, 505-510.

Hardie, B.G.S., Johnson, E.J. & Fader, P.S. (1993). Modeling loss aversion and reference dependence effects on brand choice. *Marketing Science, 12*, 378-394.

Helson, H. (1964). *Adaption Level Theory*. New York, NY: Harper & Row

Joormann, J., & Siemer, M. (2004). Memory accessibility, mood regulation, and dysphoria: Difficulties in repairing sad mood with happy memories? *Journal of Abnormal Psychology, 113,* 179-188.

Keil, A., Moratti, S., Sabatinelli, D., Bradley, M. M., & Lang, P. J. (2005). Additive effects of emotional content and spatial selective attention on electrocortical facilitation. *Cerebral Cortex, 15*, 1187-1197.

Lang, P. J. (1993). The network model of emotion: Motivational connectsion. In R. S. Wyer, Jr., & T. K. Srull (Eds.) *Advances in Social Cognition, Vol. VI: Perspectives on Anger and*

Emotion (pp. 109-134). Hillsdale, NJ: Lawrence Erlbaum

Müller, M. M., Andersen, S., & Keil, A. (2008). Time course of competition for visual processing resources between emotional pictures and a foreground task. *Cerebral Cortex, 18*, 1892-1899.

Nolen-Hoeksema, S., & Morrow, J. (1993). Effects of rumination and distraction on naturally occurring depressed mood. *Cognition & Emotion, 7,* 1993, 561-570.

Pessoa, L. (2005). To what extent are emotional visual stimuli processed without attention and awareness? *Current Opinion in Neurobiology, 15*, 188-196.

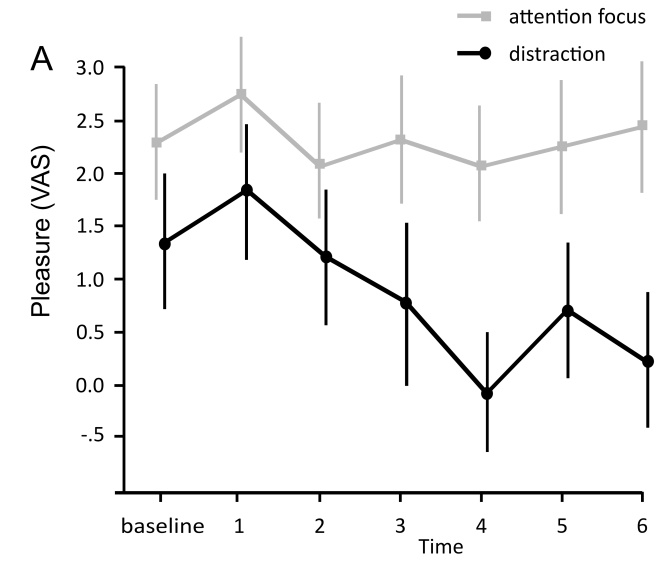
Rozin, P., Ebert, L., & Schull, J. (1982). Some like it hot: a temporal analysis of hedonic responses to chili pepper. *Appetite, 3*, 13-22.

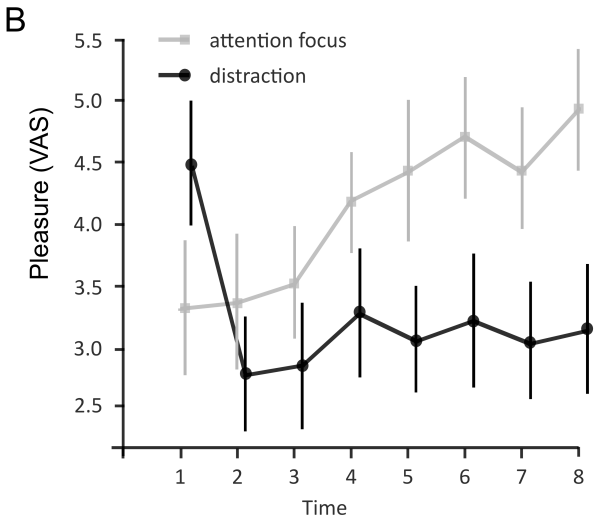
Witkin, H. A., Oltman, P, K., Raskin, E., & Karp, S. A. (1971). *A manual for the embedded figures tests*. Palo Alto, CA: Consulting Psychologists Press.

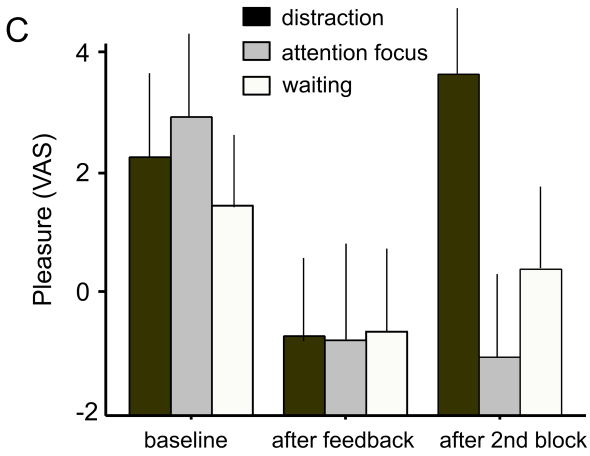
Figure Captions

Figure 1.

Distraction leads to shorter duration of emotional experience than focusing attention on the eliciting event. Panel A: Pilot study – Attention focus maintains emotional experience after positive performance feedback longer than attention distraction. Panel B: Study 1 – Attention focus maintains emotional experience longer than attention distraction after winning a game of chess. Panel C: Study 2 - Attention focus leads to longer duration of experiencing negative emotions after receiving negative performance feedback than distraction or waiting.


A
attention focus
distraction
Pleasure (VAS)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-.5
baseline
1
2
3
4
5
6
Time


B
attention focus
distraction
Pleasure (VAS)
5.5
5.0
4.5
4.0
3.5
3.0
2.5
1
2
3
4
5
6
7
8
Time


C
distraction
attention focus
waiting
Pleasure (VAS)
4
2
0
-2
baseline
after feedback
after 2nd block